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ABSTRACT

This study illustrates the means by which empirical data obtained from the Alabama Initial Certification Test (AICT) of 590 undergraduates at a state institution can be analyzed statistically to determine the institution's efficacy in teaching. The Kruskal-Wallis one-way analysis of variance procedure was selected as the test statistic to analyze data obtained from each of the four AICT subtests based on five yearly intervals: 1980-81, 1981-82, 1982-83, 1983-84, and 1984-85. When statistical significance was established, the Mann-Whitney U test was used as the follow-up procedure to determine which group or groups differed from the other groups. The results indicate that at least one of the mean ranks of the undergraduates on the humanistic behavioral studies, curriculum and instruction, and evaluation subtests significantly differed from one or more of the mean ranks of their peers based on the five yearly intervals. The mean ranks of undergraduates on the curriculum and instruction subtest for the 1983-84 and 1984-85 yearly intervals were significantly higher than the mean ranks of their peers on the earlier three yearly intervals. The mean rank of undergraduates on this subtest for the 1984-85 yearly interval was significantly higher than the mean rank of their peers for the 1983-84 yearly interval. Study findings support a higher performance among recent undergraduates when compared to persons graduating earlier. Eight data tables are included. (TJH)

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A COMPARISON OF RECENT UNDERGRADUATES PERFORMANCE TO THE ATTAINMENT OF THEIR FORMER PEERS ON THE ALABAMA INITIAL CERTIFICATION TEST

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ABSTRACT

Since educational institutions are held accountable by various accrediting agencies regarding their program results, it is necessary to conduct databased research to acquire supportive evidence concerning an institution's efficacy. This study illustrates how empirical data obtained from the Alabama Initial Certification Test (AICT) of 590 undergraduates at a state institution can be analyzed statistically in order to fulfill the aforementioned expectation.

The Kruskal-Wallis one-way analysis of variance procedure was selected as the test statistic to analyze the data obtained from each of the four AICT subtests based on the following five yearly intervals: 1980-1981, 1981-1982, 1982-1983, 1983-1984, 1984-1985. When statistical significance was established, the Mann-Whitney U test was used as the follow-up procedure to determine which group or groups differed from the other groups.

The aforesaid statistical procedures produced several findings. At least one of the mean ranks of the undergraduates on the (1) humanistic and behavioral studies, (2) curriculum and instruction, and (3) evaluation, subtests differed significantly from one or more of the mean ranks of their peers based on the aforesaid yearly intervals, $p < .05$. More specific outcomes were also detected. For example, the mean ranks of undergraduates on the curriculum and instruction subtest for the 1983-1984 and 1984-1985 yearly intervals were significantly higher than the mean ranks of their peers on this subtest for the 1980-1981, 1981-1982, and 1982-1983 yearly intervals, $p < .05$. Additionally, the mean rank of undergraduates on this subtest for the 1984-1985 yearly intervals was significantly higher than the mean rank of their peers for the 1983-1984 year interval. $p < .05$. The findings of this empirical investigation basically support that more recent undergraduates performed higher than their former peers on three of the four AICT subtests.

INTRODUCTION

Since educational institutions are held accountable by various accrediting agencies regarding their program results, it is necessary to conduct databased research to acquire supportive evidence concerning an institution's efficacy. This study illustrates how empirical data obtained from the Alabama Initial Certification Test (AICT) of 590 undergraduates at a state institution can be analyzed statistically in order to fulfill the aforementioned expectation.

Test data obtained from the AICT were statistically analyzed according to the following five yearly intervals: 1980-1981, 1981-1982, 1982-1983, 1983-1984, 1984-1985. The scores from the following AICT subtests were used: (1) Humanistic and Behavioral Studies (H & BS), (2) Curriculum and Instruction (C & I), (3) Evaluation (EVAL) and (4) Policies, Organization and Legal Basis of Education (PO & LBE). Additionally four hull hypotheses were generated for the AICT subtest scores based on the aforesaid yearly intervals.

AICT Hypotheses Based on the Five Yearly Intervals for Class B Graduates

Null Hypothesis I

The H & BS subtest scores of the five different yearly intervals for Class B graduates will be the same.

Null Hypothesis II

The C&I subtest scores of the five different yearly intervals for Class B graduates will be the same.

Null Hypothesis III

The EVAL subtest scores of the five different yearly intervals for Class B graduates will be the same.

Null Hypothesis IV

The PO & LBE subtest scores of the five different yearly intervals for Class B graduates will be the same.

The five yearly intervals constituted the independent variable (IV) and the four AICT subtest scores served as dependent variables (DV).

Non-parametric statistics are appropriately used to analyze ordinal data as well as with groups having unequal numbers (i.e., varying in size) which was typical regarding the various groups based on yearly intervals of this study. Since statisticians (Ferguson, 1976) have established that the Kruskal-Wallis One-Way Analysis of Variance procedure to be one of the best non-parametrics, it was selected as the test statistic to analyze the data. When the data provided evidence establishing statistical significance, the Mann-Whitney U-Test was used as the follow-up procedure to determine which group or groups differed from the other groups.

The hypothesis-wise error rate for each pair-wise comparison of the groups based on the five yearly intervals in order to maintain an overall experiment-wise error rate at the .05 level is .005.

AICT RESULTS

The following results were obtained from the analyses of data by using the statistical programs from the Statistical Package for Social Sciences (SPSS).

Null Hypothesis I

Since null hypothesis I is rejected with a 95% level of confidence, this result indicates that at least one of the mean ranks of Class B graduates on the H & BS subtest is significantly different from one or more of the mean ranks of their peers on this subtest based on the five yearly intervals (see Table I). At this point in the analysis, it is not possible to state which yearly interval or intervals differ from other yearly intervals.

TABLE I

KRUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE TABLE

IV= FIVE YEARLY INTERVALS
DV= H & BS SUBTEST SCORES OF CLASS B GRADUATES

YEARLY INTERVAL	1980-81	1981-82	1982-83	1983-84	1984-85
NUMBER	47	121	129	125	168
MEAN RANKS	224.71	251.29	248.63	338.58	351.08

			CORRECTED FOR TIES	
CASES	CHI-SQUARE	SIGNIFICANCE	CHI-SQUARE	SIGNIFICANCE
590	51.840	0.000	51.932	0.000

Using the Mann-Whitney U-Test as the follow-up procedure to determine which yearly interval or intervals differed from the other, the following results were obtained. First, the mean ranks of Class B graduates on the H & BS subtest for the 1983-1984 and 1984-1985 yearly intervals were significantly higher than the mean ranks of their peers on this subtest for the 1980-1981, 1981-1982 and 1982-1983 yearly intervals. Second, there were no statistically significant differences detected for the mean ranks of Class B graduates on this subtest among the following yearly intervals: 1980-1981, 1981-1982 and 1982-1983. Third, even though significant differences were detected for the 1983-1984 and 1984-1985 yearly intervals in relation to the three aforesaid yearly intervals, no significant differences were detected between these two last yearly intervals (see Table II).

Null Hypothesis II

Since the H-test value after correcting for ties is 86.56, $p < .001$, there is sufficient evidence to reject null hypothesis II (see Table III for additional information). This result indicates that at least one of the mean ranks of Class B graduates on the C & I subtest is significantly different from one or more of the mean ranks of their peers on this subtest based on the five yearly intervals. At this point in the analysis, it is not possible to state which yearly interval or intervals differ from other yearly intervals.

The following results were obtained based on the Mann-Whitney U-Test as the follow-up procedure. First, the mean ranks of Class B graduates on the C & I subtest for the 1983-1984 and 1984-1985 yearly intervals were significantly higher than the mean ranks of their peers on this subtest for the 1980-1981, 1981-1982 and 1982-1983 yearly intervals. Second, there were no statistically significant difference detected for the mean ranks among the following yearly intervals: 1980-1981, 1981-1982 and 1982-1983. Third, the mean rank of Class B graduates on this subtest for the 1984-1985 yearly intervals also was significantly higher than the mean rank of their peers for the 1983-1984 yearly interval (see Table IV).

TABLE II

MANN-WHITNEY FOLLOW-UP TABLE ON
PAIR-WISE COMPARISONS

IV = FIVE YEARLY INTERVALS
DV = H & BS SUBTEST SCORES OF CLASS B GRADUATES

YEARLY INTERVAL	MEAN RANK	NUMBER	U	W	EXACT 2-TAILED p	Z	CORRECTED FOR TIES 2-TAILED p
1980-81	79.00	47	2585.0	3713.0		-0.9170	0.3591
1981-82	86.64	121					
1980-81	83.15	47	2780.0	3908.0		-0.8428	0.3993
1982-83	90.45	129					
1980-81	62.14	47	1792.5	2920.5		-3.9400	0.0001*
1983-84	95.66	125					
1980-81	126.21	121	2276.0	3404.0		-4.4432	0.0000*
1984-85	117.95	168					
1981-82	72.43	47	7718.0	15272.0		-0.1518	0.8794
1982-83	124.83	129					
1981-82	104.57	121	5271.5	12652.5		-4.1113	0.0000*
1983-84	141.83	125					
1981-82	116.88	121	6761.0	14142.0		-4.8612	0.0000*
1984-85	165.26	168					
1982-83	107.93	129	5538.0	18462.0		-4.3170	0.0000*
1983-84	147.70	125					
1982-83	120.42	129	7149.0	15534.0		-5.0332	0.0000*
1984-85	170.95	168					
1983-84	142.40	125	9924.5	17799.5		-0.8038	0.4215
1984-85	150.43	168					

* α(H-W) = .005; α(E-W) = .05

$p < .05$

TABLE III

KRUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE TABLE

IV = FIVE YEARLY INTERVALS
DV = C & I SUBTEST SCORES OF CLASS B GRADUATES

YEARLY INTERVAL	1980-81	1981-82	1982-83	1983-84	1984-85
NUMBER	47	121	129	125	168
MEAN RANKS	218.50	229.24	243.74	327.29	380.86

			CORRECTED FOR TIES	
CASES	CHI-SQUARE	SIGNIFICANCE	CHI-SQUARE	SIGNIFICANCE
590	86.237	0.000	86.560	0.000

Null Hypothesis III

Since null hypothesis III is rejected with a 95% level of confidence, this result indicates that at least one of the mean ranks of Class B graduates on the EVAL subtest is significantly different from one or more of the mean ranks of their peers on this subtest based on the five yearly intervals (see Table V). At this point in the analysis, it is not possible to state which yearly interval or intervals differ from other yearly intervals.

Using the Mann-Whitney U-Test as the follow-up procedure to determine which yearly interval or intervals differed from the others, the following results were obtained. The mean rank of Class B graduates on the EVAL subtest for the 1984-1985 yearly interval was significantly higher than the mean ranks of their peers on this subtest for the 1981-1982, 1982-1983 and 1983-1984 yearly intervals, but it was not significantly higher than the 1980-1981 yearly interval. There was no statistically significant difference in the mean ranks of Class B graduates on this subtest among the following yearly intervals: 1980-1981, 1981-1982, 1982-1983 and 1983-1984 (see Table VI).

TABLE IV

MANN-WHITNEY FOLLOW-UP TABLE ON
PAIR-WISE COMPARISONS

IV = FIVE YEARLY INTERVALS
DV = C & I SUBTEST SCORES OF CLASS B GRADUATES

YEARLY INTERVAL	MEAN RANK	NUMBER	U	W	EXACT 2-TAILED p	Z	CORRECTED FOR TIES 2-TAILED p
1980-81	82.38	47	2744.0	3872.0		-0.3540	0.7233
1981-82	85.32	121					
1980-81	83.15	47	2780.0	3908.0		-0.8447	0.3983
1982-83	90.45	129					
1980-81	62.59	47	1813.5	2941.5		-3.8706	0.0001*
1983-84	95.49	125					
1980-81	62.38	47	1804.0	2932.0		-5.7070	0.0000*
1984-85	120.76	168					
1981-82	122.26	121	7412.0	14793.0		-0.6898	0.4903
1982-83	128.54	129					
1981-82	101.74	121	4929.0	12310.0		-4.7282	0.0000*
1983-84	144.57	125					
1981-82	102.93	121	5073.5	12454.5		-7.2876	0.0000*
1984-85	175.30	168					
1982-83	109.18	129	5699.5	18300.5		-4.0434	0.0001*
1983-84	146.40	125					
1982-83	110.56	129	5877.5	14262.5		-6.7731	0.0000*
1984-85	178.51	168					
1983-84	129.82	125	8353.0	16228.0		-2.9997	0.0027*
1984-85	159.78	168					

*α(H-W) = .005; α (E-W) = .05

p < .05

TABLE V

KRUSKAL-WALLIS ONE-WAY ANALYSIS OF
VARIANCE TABLE

IV = FIVE YEARLY INTERVALS
DV = EVAL SUBTEST SCORES OF CLASS B GRADUATES

YEARLY INTERVAL	1980-81	1981-82	1982-83	1983-84	1984-85
NUMBER	47	121	129	125	168
MEAN RANKS	284.95	275.51	267.97	283.19	343.15

			CORRECTED FOR TIES	
CASES	CHI-SQUARE	SIGNIFICANCE	CHI-SQUARE	SIGNIFICANCE
590	18.988	0.001	19.039	0.001

Null Hypothesis IV

Even though null hypothesis IV is rejected with a 95% level of confidence, the Mann-Whitney U-Test indicated the following result. There were no significant difference in the mean ranks of Class B graduates on the PO & LBE subtest among any of the five yearly intervals (see Tables VII and VIII).

TABLE VI

MANN-WHITNEY FOLLOW-UP TABLE ON
PAIR-WISE COMPARISONS

IV = FIVE YEARLY INTERVALS
DV = EVAL SUBTEST SCORES OF CLASS B GRADUATES

YEARLY INTERVAL	MEAN RANK	NUMBER	U	W	EXACT 2-TAILED p	Z	CORRECTED FOR TIES 2-TAILED p
1980-81	85.99	47	2773.5	4041.5		-0.2500	0.8026
1981-82	83.92	121					
1980-81	92.50	47	2843.5	4347.5		-0.6324	0.5271
1982-83	87.04	129					
1980-81	84.16	47	2827.5	3955.5		-0.3791	0.7046
1983-84	87.38	125					
1980-81	94.30	47	3304.0	4432.0		-1.7168	0.0860
1984-85	111.83	168					
1981-82	128.03	121	7498.0	15492.0		-0.5406	0.5888
1982-83	123.12	129					
1981-82	119.29	121	7053.0	14434.0		-0.9154	0.3600
1983-84	127.58	125					
1981-82	127.26	121	8018.0	15399.0		-3.0707	0.0021*
1984-85	157.77	168					
1982-83	123.14	129	7500.5	16499.5		-0.9616	0.3362
1983-84	132.00	125					
1982-83	129.66	129	8341.0	16726.0		-3.4108	0.0006*
1984-85	163.85	168					
1983-84	125.24	125	7780.0	15655.0		-3.8014	0.0001 *
1984-85	163.19	168					

* α (H-W) = .005; α (E-W) = .05

$p < .05$

TABLE VII

KRUSKAL-WALLIS ONE-WAY ANALYSIS OF
VARIANCE TABLE

IV = FIVE YEARLY INTERVALS
DV = PO & LBE SUBTEST SCORES OF CLASS B GRADUATES

YEARLY INTERVAL	1980-81	1981-82	1982-83	1983-84	1984-85
NUMBER	47	121	129	125	168
MEAN RANKS	251.31	292.51	267.67	310.00	320.60

			CORRECTED FOR TIES	
CASES	CHI-SQUARE	SIGNIFICANCE	CHI-SQUARE	SIGNIFICANCE
590	11.179	0.025	11.235	0.024

TABLE VIII

MANN-WHITNEY FOLLOW-UP TABLE ON
PAIR-WISE COMPARISONS

IV = FIVE YEARLY INTERVALS
DV = PO & LBE SUBTEST SCORES OF CLASS B GRADUATES

YEARLY INTERVAL	MEAN RANK	NUMBER	U	W	EXACT 2-TAILED p	Z	CORRECTED FOR TIES 2-TAILED p
1980-81	76.43	47	2464.0	3592.0		-1.3672	0.1716
1981-82	87.64	121					
1980-81	87.41	47	2980.5	4108.5		-0.1720	0.8634
1982-83	88.90	129					
1980-81	70.28	47	2175.0	3303.0		-2.6325	0.0085
1983-84	92.60	125					
1980-81	89.19	47	3064.0	4192.0		-2.3651	0.0180
1984-85	113.26	168					
1981-82	132.39	121	6971.0	16019.0		-1.4734	0.1406
1982-83	119.04	129					
1981-82	117.35	121	6818.5	14199.5		-1.3412	0.1799
1983-84	129.45	125					
1981-82	138.13	121	9333.0	16714.0		-1.1913	0.2335
1984-85	149.95	168					
1982-83	117.16	129	6728.5	17271.5		-2.2848	0.0223
1983-84	138.17	125					
1982-83	137.58	129	9363.0	17748.0		-2.0153	0.0439
1984-85	157.77	168					
1983-84	138.77	125	9471.5	17346.5		-1.4413	0.1495
1984-85	153.12	168					

*$\alpha_{(H-W)} = .005$; $\alpha_{(E-W)} = .05$

$p < .05$

CONCLUSIONS

Interpretations of the aforesaid results are to be presented in the following manner. First, an inference regarding each null hypothesis is to be developed and second, the interrelationships of several outcomes are to be discussed. Even though the following conclusions are viable explanations of the results, it is important to note that other interpretations may be equally appropriate.

Null Hypothesis I

Since the mean ranks on the H & BS subtest were significantly different for the five yearly intervals, a follow-up procedure was used to determine which yearly interval or intervals differed from the others. Based on these outcomes, it is proper to make the following conclusions. First, considering the mean ranks of Class B graduates on the aforesaid subtest for the 1983-84 and 1984-85 yearly intervals were significantly higher than the mean ranks of their peers for the three former yearly intervals, an acceptable inference would be that the most recent Class B graduates' performance on this subtest was superior to the attainment exhibited by earlier Class B graduates. Second, there were no statistically significant difference detected for the mean ranks of Class B graduates on this subtest among the following yearly intervals 1980-81, 1981-82 and 1982-83. Thus, it is proper to conclude that an improvement in the aspects of the Class B program pertaining to Humanistic and Behavioral Studies preparation probably began to occur during the 1982-83 academic period. Third, due to the finding that no significant differences were detected between the two last yearly intervals, (i.e., 1983-84 and 1984-85 periods), one might conclude that improvement in the Humanistic and Behavioral Studies preparation aspects of the Class B program did not continue. In summary, it is important to note that the data analyses support the effectiveness of modifications pertaining to Humanistic and Behavioral Studies preparation.

Null Hypothesis II

There was sufficient statistical evidence to support a significant difference among the mean ranks of the Class B graduates on the C & I subtest for the five yearly intervals. Thus, a follow-up procedure was used to determine which yearly interval or intervals differed from the other yearly intervals. Based on these results, it is acceptable to deduce the following inferences. First, since the mean ranks of Class B graduates on this subtest for the 1983-84 yearly intervals were significantly higher than the mean ranks of their peers for the 1980-81, 1981-82 and 1982-83 yearly intervals, an appropriate conclusion would be that

recent Class B graduates' performance on this subtest was superior to the accomplishment characterizing former Class B graduates. Second, no statistically significant differences were established between the 1980-81, 1981-82 and 1982-83 mean ranks of Class B graduates on this subtest. Thus, it is concluded that improvement in those aspects of the Class B program concerning curriculum and instruction preparation probably resulted during the 1982-83 academic period. Third, considering the mean rank of Class B graduates on this subtest for the 1984-85 yearly interval was significantly higher than the mean rank of their peers for the 1983-84 yearly interval, an acceptable conclusion is that improvement in the curriculum and instruction aspects of the Class B program has continued. In summary, the data analyses strongly supports the effectiveness of program modifications pertaining to curriculum and instruction studies preparation.

Null Hypothesis III

Since the mean ranks on the EVAL subtest based on the five yearly intervals were significantly different, a follow-up procedure was used. Based on these outcomes, it is appropriate to draw the following conclusions. Considering the mean rank of Class B graduates on the aforesaid subtest for the 1984-85 yearly interval was statistically higher than the mean ranks of their peers for the 1981-82, 1982-83 and 1983-84 yearly intervals; yet, was not significantly higher than the 1980-81 yearly interval, this finding is suggestive of the conclusion that performance on this may have declined before advancement in program effectiveness pertaining to evaluation occurred during the 1983-84 academic year. Since no statistically significant findings were detected among the mean ranks of the first four yearly intervals, this finding is supportive of the conclusion that program modifications regarding evaluation possibly harmed some students' acquisition of evaluation concepts. For example, evaluation concepts were taught in education psychology (EPY 332) prior to the introduction of educational measurement (EPY 442). When educational measurement was introduced into the Class B program during the summer of 1982, evaluation concepts and principals were deleted from the educational psychology course. Only students participating in Cycle II of the Class B program were required to take educational measurement. Thus, many students participating in Cycle I of the Class B program probably did not receive preparation regarding educational evaluation. Eventually, the vast majority of JSU students participated in Cycle II in which they were required to enroll in the undergraduate measurement course. In summary, the data analyses support the conclusion that improvement in the Class B graduates' acquisition of evaluation material resulted when the majority of the JSU undergraduates participated in Cycle II in which they enrolled in educational measurement.

Null Hypothesis IV

Since there were no significant differences in the mean ranks of Class B graduates on the PO & LBE subtest among any of the five yearly intervals, the following conclusions are justifiable. There has been no improvement in the Class B graduates' acquisition of material pertaining to the policies, organization and legal basis of education. However, these Class B graduates' performance in this area of undergraduate training has been sufficiently high over the entire five year intervals. Thus, this finding does not justify the necessity of higher performance by more recent undergraduates.

DISCUSSION

Next, the interrelationships of the independently derived outcomes of various null hypotheses' testings are to be reviewed. The various interpretations based on the statistical analyses of data from the AICT subtest scores for the five yearly intervals were usually highly consistent. In most cases, the more recent Class B graduates on the H & BS, C & I, as well as EVAL subtests performed significantly higher than did their peers graduating earlier. These findings are suggestive of the idea that present Class B programs involving the aforesaid areas should be maintained. Since performance on the PO & LBE for the five yearly intervals was essentially the same, this finding suggests that some modification in Class B programs involving policies, organization and legal basis of education might be justifiable. However, since performance on this subtest was consistently higher for all five yearly intervals, the aforesaid conclusion is not actually supported by this study.

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